

## INTRODUCTION

XSeries<sup>G4</sup> devices, from the Totalflow division of ABB provide functionality only possible through the convergence of RTU, PLC and flow computer concepts. Representing a unique milestone in the development of remote, low power, powerful measurement and control devices, ABB Totalflow's XSeries<sup>G4</sup> products are available in one of two product families;



- eXtendable Flow Computers (XFC<sup>G4</sup>)
- eXtendable Remote Controllers (XRC<sup>G4</sup>)

This datasheet focuses on the XFC<sup>G4</sup> products for differential meters. The XFC<sup>G4</sup> is the “fourth generation” of Totalflow flow computers. Benefits and features of these particular products include:

- Smart Integral Multivariable Transducer (XIMV)
- Comprehensive custody quality data history
- Automation, control, alarming and data logging capability
- Base IO targeted at low cost automation projects
- Local display and optional keypad
- Quick, easy installation
- Flexible communications
- Onboard Ethernet port
- Backward compatibility
- Extendable hardware and software

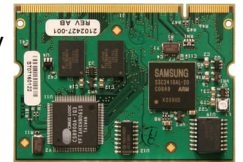
With low power, accuracy and system integrity built in, these devices are proven daily on thousands of sites. Totalflow products provide users the best opportunity for successful projects – site by site or system by system.

## DESCRIPTION

The XFC<sup>G4</sup> includes an Integral Multivariable Transducer (XIMV) to measure differential pressure, static pressure and temperature from a single differential pressure meter run. The XIMV is housed in a shielded environmentally protected enclosure which is mounted inside the flow computer enclosure

and is characterized and calibrated at Totalflow's factory. Multi-tube capability (up to 20 tubes) is available in each unit and is easily invoked with a few configuration changes and interface connection to external transducers, either digital or analog.

The XFC<sup>G4</sup> features a powerful 203Mhz ARM920T 32 bit microprocessor and Windows CE operating system. The XFC<sup>G4</sup> utilizes a unique “engine card” design. The engine card contains the processor, application firmware and memory components. This allows the user to move the engine card with all programming intact from one device to another if necessary. The processing and memory capability of this device, allows the user to run more applications faster than ever before. Up to twelve (12) AGA3 measurement tubes performing full calculations once a second and twelve (12) advanced plunger lift applications may be running in a single XFC<sup>G4</sup>.



In addition to the basic flow computer inputs (DP, SP and TF), the standard device includes: two (2) analog inputs (0-10 volts DC), two (2) digital outputs and two (2) digital inputs which can be configured as either status inputs or pulse accumulator inputs.

IO modules can be added to extend the hardware IO capability. The XFC<sup>G4</sup> 6413 accommodates up to three (3) TFIO modules and the XFC<sup>G4</sup> 6713 accommodates up to six (6). The XFC<sup>G4</sup> 6410 does not support TFIO modules due to its smaller enclosure.

Each unit is powered by an internal battery that can be solar charged (or other suitable DC supply) for remote unattended operation. Several charging options are available.

Communications interface cables and equipment can be installed at the factory, ready for quick field installation.

Checking and modifying configuration and calibration is accomplished with ABB Totalflow's PCCU32 laptop software running on a 32-bit Windows operating system.

In addition to the local configuration port, two communications ports are supplied with the standard

unit. These ports are modular and user selectable for RS232 and/or RS485. An additional port may be added using a TFIO Communications Module. Available protocols include Totalflow native low power, Modbus RTU or ASCII, Enron Modbus, LevelMaster, as well as several others.

One integrated 10Base-T Ethernet port for network connectivity is standard and a USB port for Flash download and local configuration is available as an option.

## HARDWARE MODULARITY

Hardware functionality of XSeries<sup>G4</sup> devices can be extended in a flexible and simple way by adding modular IO as needed.



Totalflow's TFIO modules are designed to accommodate low power, harsh environments at economical cost. The system recognizes the module types automatically and configures the IO Scanner subsystem accordingly.

Supported TFIO Modules Include:

- Analog In (8 channel)
- Analog Out (4 channel)
- Binary (DI, DO, PI-8 channels, software selectable)
- RTD (4 channel)
- Thermocouple (4 channel)
- Valve Control (digital or analog)
- Communications (software selectable RS232, 485, 422-1 channel)

For more detailed information about TFIO modules request information on datasheets 2101105 through 2101112.

## SOFTWARE MODULARITY

The software design represents significant modularization through use of object oriented design principles. This allows a flexible and stable real time environment. Totalflow supplied objects (applications) can be enabled in our factory or by you, one or more times on the same device. It is this framework that allows the support for multi-tube measurement.

Supported Software applications continually grow. A sample of standard applications include:

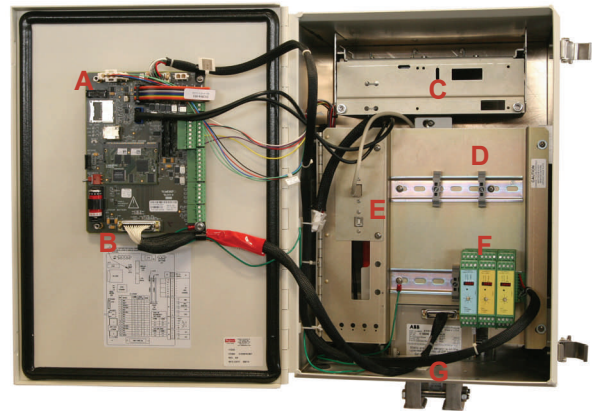
- AGA3 orifice meter run
- ISO 5167 orifice meter run (*future*)
- VCone meter run
- AGA7 rotary/turbine meter run
- CO2 (NIST) Orifice (*future*)
- Wedge Meter (water or gas) (*future*)
- Ultrasonic meter run (*future*)
- Coriolis (gas) (*future*)
- Real-time Data logger (trending)
- Valve Control (Feedback controller)
- RAMS (Alarming, Exception Reporting)
- Operators (simple custom math / logic)
- IEC 61131 (ISaGRAF)
- Selectable Units (user selectable engineering units) (*future*)
- Display / Keypad Handler
- IO subsystem Handler
- Tank Level Application
- Therms master application
- Therms slave application
- Multiple protocols (Totalflow native low power, Modbus slave (binary/ASCII), Modbus master (binary/ASCII), LevelMaster, Btu 8000/8001, Enron Modbus, MotorSaver, ABB 267CS/269CS XMV Multivariable, Altronic and others)

## XSERIES<sup>G4</sup> FLOW COMPUTER FEATURES

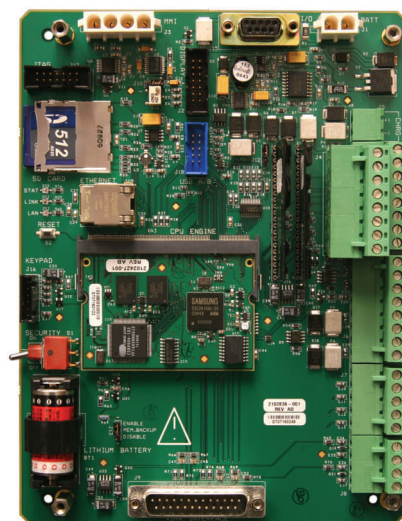
- 203Mhz ARM920T 32 bit microprocessor
- Windows CE operating system (allows for a single software development environment for all G4 products)
- Integrated Ethernet 10Base-T port (full networking capabilities)
- USB host and USB device ports (ver 1.1): used for flashing new firmware and may be used as a high speed local configuration and collection port
- SD Card capability (future non-volatile memory expansion)
- Significant hardening against over-current / transients
  - ◇ Positive Temperature Coefficient, resetting fuses and transient protection on
    - \* VBATT and SWVBATT Outputs
    - \* Each of the Digital Outputs
    - \* Battery Charger Input
  - ◇ Power supply circuit designed to protect XIMV from hot insertion
- Base IO on XFC<sup>G4</sup> main electronics board
  - ◇ 2 Analog Inputs
  - ◇ 2 Digital Inputs (may be used as hi-speed PI inputs)
  - ◇ 2 Digital Outputs

- ◇ Battery Voltage
- ◇ Charger Voltage
- Low power design operating as low as 8 ma (<100 mW with minimal configuration)
- Aluminum powder coated enclosure (3R)
- Flexible accommodation of communications hardware
- Cost effective communications kits
- Stable time base (accurate integration)
- Rechargeable, lead acid batteries
- Solar, AC or DC charging options
- Dual level security code data protection
- Custody Transfer Applications
  - ◇ Monitors user limits for detection, and reporting of abnormal conditions
  - ◇ Defaults to 40 Days of hourly and 50 Days of daily data. User configurable.
  - ◇ Defaults to 200 Events. User configurable.
  - ◇ Complies with API 21.1 standard for custody measurement devices
  - ◇ Flow and energy calculations per AGA3-85, AGA3-92, AGA-7, and AGA-5
  - ◇ Meets Flow Computer requirements as stated in AGA Report No. 9, "Measurement of Gas by Multi-path Ultrasonic Meters"
  - ◇ Super compressibility calculations per NX-19, AGA8-92 Gross or Detail
  - ◇ Smart (temperature and pressure compensated) integral, factory calibrated, multivariable transducer (XIMV)
  - ◇ All calculations performed once per second (user configurable to longer period)
  - ◇ Flow retention during user transducer calibration
  - ◇ Selectable 3 or 5 point user calibration of Analog Inputs
  - ◇ User definable DP zero flow cut-off
  - ◇ 100 ohm platinum RTD
  - ◇ Automatic internal calibration of RTD with user programmable offset
- Class I, Division 2 Groups C and D, CSA C/US Hazardous Area Classifications (ATEX Zone 2 pending)
- Real time clock that continues running on lithium battery (maintains data backup)
- Advanced embedded data logger (Trending)
- Programmable alarm filtering
- Exception reporting capability
- Multiple protocol options including Totalflow packet protocol, various Modbus protocols and others
- User programmable Modbus register maps (both slave and master)

- User programmable math and logic sequences
- IEC 61131 Capability (ISaGRAF)
- Valve Control and Nominations Capability



- A. XFC<sup>G4</sup> Board
- B. Ethernet port
- C. Communications Equipment Compartment
- D. Battery Compartment
- E. USB (Host & Device)
- F. TFIO expansion modules
- G. Integrated Multivariable Transducer



| General Specifications                 |  | XFC <sup>G4</sup> 6410      | XFC <sup>G4</sup> 6413   | XFC <sup>G4</sup> 6713    |
|--|--|-----------------------------|--------------------------|---------------------------|
| <b>Dimensions</b>                      | Width  | 10.000 in. (254.00 mm)      | 12.756 in. (324.00 mm)   | 14.920 in. (379.53 mm)    |
|  | Height   | 13.200 in. (335.28 mm)      | 17.825 in. (452.76 mm)   | 21.845 in. (554.86 mm)    |
|  | Depth  | 9.370 in. (233.00 mm)       | 10.269 in. (260.83 mm)   | 13.710 in. (348.23 mm)    |
| <b>Installed Depth</b>                 | (Pipe Mount)   | 10.680 in. (271.27 mm)      | 11.584 in. (294.23 mm)   | 14.560 in. (369.82 mm)    |
|  | (Wall Mount)   | 10.120 in. (257.05 mm)      | 11.019 in. (279.88 mm)   | 14.000 in. (355.60 mm)    |
| <b>Weight (w/o Battery)</b>            |  | Approx. 13.5 lbs. (6.13 kg) | Approx. 15 lbs. (6.8 kg) | Approx. 29 lbs. (13.1 kg) |
| <b>Max IO Modules</b>                  |  | 0                           | 3                        | 6                         |
| <b>Max Battery Capacity</b>            |  | 26AH                        | 26AH                     | 42AH                      |
| <b>Certification</b>                   | CSA C/US Class 1, Division 2, Groups C & D hazardous area classification. (ATEX Zone 2 pending)  |                             |                          |                           |
| <b>Mounting</b>                        | Wall, pipe, or direct  |                             |                          |                           |
| <b>Operating Temperature (ambient)</b> | -40°F to 140°F (-40°C to 60°C)   |                             |                          |                           |
| <b>Humidity</b>                        | 0 - 95% non-condensing   |                             |                          |                           |
| <b>EMC Requirements</b>                | <p>EMMISSIONS:</p> <p><i>European Regions:</i><br/>EN55022: 1996 Class B Emissions (Radiated &amp; Conducted)</p> <p><i>North America Regions:</i><br/>CFR 47, Part 15, Subpart B, Class B, FCC Emissions<br/>ICES-003 Issue 4 CAN/CSA-CEI/IEC CISPR 22:02, Class B ITE Emissions<br/>AS/NZS CISPR 22-2004 (Australia/New Zealand)</p> |                             |                          |                           |
|  | <p>IMMUNITY: <i>European Regions:</i><br/>EN61000-6-1 : 2001 Immunity<br/>EN61000-4-2 ESD: 1995 ± 8 kV Air, ± 4 kV Contact<br/>EN61000-4-3: 2005 RF Immunity, 3/10 V/m<br/>EN61000-4-4 EFT: 2004 1 kV<br/>EN61000-4-6: 2005: Conducted Susceptibility, 3/10 Vrms<br/>EN61000-4-8: 1994: Power Frequency Magnetic Field 10 A/m</p>      |                             |                          |                           |

| Integral Multivariable (XIMV) Specifications  |  |
|---|--|
| <b>Multivariable Unit</b>   |  |
| Temperature Limits  | Compensated -20 to 140°F (-29 to 60°C)<br>Operational -40 to 185°F (-40 to 85°C)<br>Storage -40 to 185°F (-40 to 85°C) |
| Analog-to-Digital Resolution (XIMV & Onboard AI's)                                  | 18 Bit maximum resolution (0.00038% FS)<br>16 Bit nominal resolution (.0015%FS)  |
| Vibration Performance   | 1.5 INW per G (2G maximum) at 1 Hz, decreasing to zero at 1 KHz in straight line mode                                  |
| Mounting Specification  | Change from perpendicular (front to back / around X-axis) will be ≤ 1.5 INW (Can be corrected with calibration)        |
| Reference Conditions  | Temperature at most recent factory or user calibration; Static Pressure and Differential Pressure ≤ 100% of URL        |
| <b>Static Pressure</b>  |  |
| Accuracy (including linearity, hysteresis, & repeatability at reference conditions) | ± 0.05% of User Calibrated Spans from 20% to 100% of URL   |
| Ambient Temperature Effect per 160 °F (71 °C)                                       | ± 0.15% of URL ± 0.125% of Reading   |
| Stability (for 12 months)   | ± 0.1% of URL  |
| <b>Differential Pressure</b>  |  |
| Accuracy (including linearity, hysteresis & repeatability at reference conditions)  | ± 0.05% of User Calibrated Spans from 20% to 100% of URL   |
| Ambient Temperature Effect per 160 °F   | ± 0.15% of URL ± 0.125% of Reading   |
| Stability (for 12 months)   | ± 0.1% of URL  |
| Static Pressure Effect (DP Zero) per 1500 psi                                       | ± 0.03% of URL per 1500 psi (3200 psi maximum)   |
| Static Pressure Effect (DP Span) per 1500 psi                                       | ± 0.1% of Reading per 1500 PSI (3200 PSI maximum)  |
| <b>Temperature</b>  |  |
| Process Range   | -80 to +230°F (-62 to 110°C)   |
| Accuracy (as shipped from factory)  | ± 0.35°F (± 0.2°C) over operating range  |
| Accuracy (after single point field calibration)                                     | ± 0.2°F (± 0.12°C) repeatability over operating range  |

| <b>Available Ranges</b> |                 |     |     |     |     |      |      |      |      |
|-------------------------|-----------------|-----|-----|-----|-----|------|------|------|------|
|                         | DP (inches H2O) |     |     |     |     |      |      |      |      |
| AP (psia)               |                 | 100 | 150 | 250 | 500 | 1000 | 1500 | 2000 | 3200 |
|                         | 100             | X   |     | X   | X   | X    | X    |      |      |
|                         | 150             | X   | X   | X   | X   | X    | X    | X    |      |
|                         | 250             | X   | X   | X   | X   | X    | X    | X    | X    |
|                         | 400             |     |     | X   |     | X    | X    |      | X    |
|                         | 800             |     |     |     |     |      | X    |      | X    |

| XFC <sup>G4</sup>                   |  |
|-------------------------------------|--|
| <b>Power</b>                        | Nominal 12 VDC battery   |
| <b>Charger</b>                      | Solar or 16-18 VDC   |
| <b>Memory</b>                       | <ul style="list-style-type: none"> <li>Windows CE Operating System, Application programs, and Configuration Files stored in 32 Megabyte Flash memory</li> <li>Data stored in 16 Megabyte Pseudo Static RAM. (lithium battery backup)</li> </ul>  |
| <b>Communications Ports</b>         | <ul style="list-style-type: none"> <li>1 - dedicated – PCCU (Local Configuration Port)</li> <li>2 - RS232 or RS485 (via board insertion modules) baud rates up to 115,200</li> <li>1 - USB 1.1 Host port - optional</li> <li>1 - USB 1.1 Device port (may be used as high-speed local configuration port) - optional</li> <li>1 - 10 Base-T Ethernet port - optional</li> </ul>  |
| <b>LCD Interface</b>                | Dedicated interface for 2 X 24 Liquid Crystal Display (LCD)  |
| <b>Keypad Interface</b>             | Dedicated interface for optional ABB supplied keypad   |
| <b>IO Expansion</b>                 | I <sup>2</sup> C Bus Interface for TFIO Modules  |
| <b>Security Switch</b>              | Dual-Level Security Switch On-Board  |
| <b>Time Base Stability</b>          | ± 7.5 ppm (parts per million)  |
| <b>IO Scan Rate</b>                 | 1 Time per Second (1 Hz)   |
| <b>Analog Inputs</b>                | <ul style="list-style-type: none"> <li>2 single-ended channels, 0-10Vdc *</li> <li>Open circuit voltage: 0 VDC</li> <li>Short circuit leakage current: 0 uA typical</li> <li>Input Impedance: 21 KΩ typical (0 - 7.5V)</li> <li>Measurable input voltage range: - 0.5V to 7.5V</li> <li>Maximum voltage on input line: 30 VDC</li> </ul> <p><i>* For 4 -20 ma inputs, an external power source may be required if device requires more than 12 VDC nominal.</i></p>  |
| <b>Analog-to-Digital Resolution</b> | 18 Bit maximum resolution (0.00038% FS)<br>16 Bit nominal resolution (.0.0015%FS)  |
| <b>Digital Inputs/Pulse Inputs</b>  | <p>2 inputs configurable as active or passive with optional software de-bounce.</p> <ul style="list-style-type: none"> <li>Open circuit voltage: 5 VDC (Internally pulled up to 5 VDC nominal)</li> <li>Short circuit leakage current: - 395 uA typical</li> <li>Input capacitance: 0.1 ufd typical</li> <li>Maximum allowable voltage range on input: - 0.5 VDC to 15 VDC</li> <li>Maximum frequency input 100 Hz @ 50% duty cycle with de-bounce enabled</li> <li>Maximum frequency input 20 KHz @ 50% duty cycle with de-bounce disabled</li> <li>Dry Contact (Form A), Open Collector or Active Voltage</li> <li>Minimum contact resistance to activate input: 1000 Ω</li> <li>Voltage threshold to deactivate the input: 3.1 V (referenced to GND terminal)</li> <li>Voltage threshold to activate the input: 0.5 V (referenced to GND terminal)</li> <li>Conductor pairs must be shielded to prevent spurious signals</li> </ul> |

XFC<sup>G4</sup>

## Digital Outputs

2 open channel FET transistor switches

- Open circuit voltage: 0 VDC
- Short circuit leakage current: 0 uA typical
- Output capacitance: 1000 pF typical
- Maximum allowable voltage range on output: - 0.5 VDC to 26.4 VDC
- Open drain FET type
- "ON" resistance: 0.1  $\Omega$  typical (including PTC fuse resistance)
- Maximum pulse current: 3 A for 5 seconds
- Maximum continuous sink current: 2 A



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